1962-03

886,142 COMPLETE SPECIFICATION

1 SHEET

This drawing is a reproduction of the Original on a reduced scale.

F/G 2121

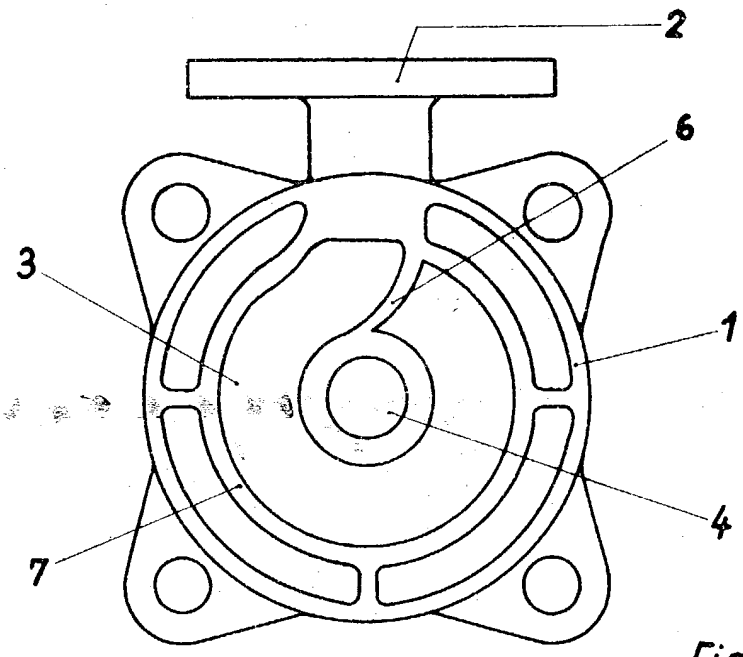

Fig. 1

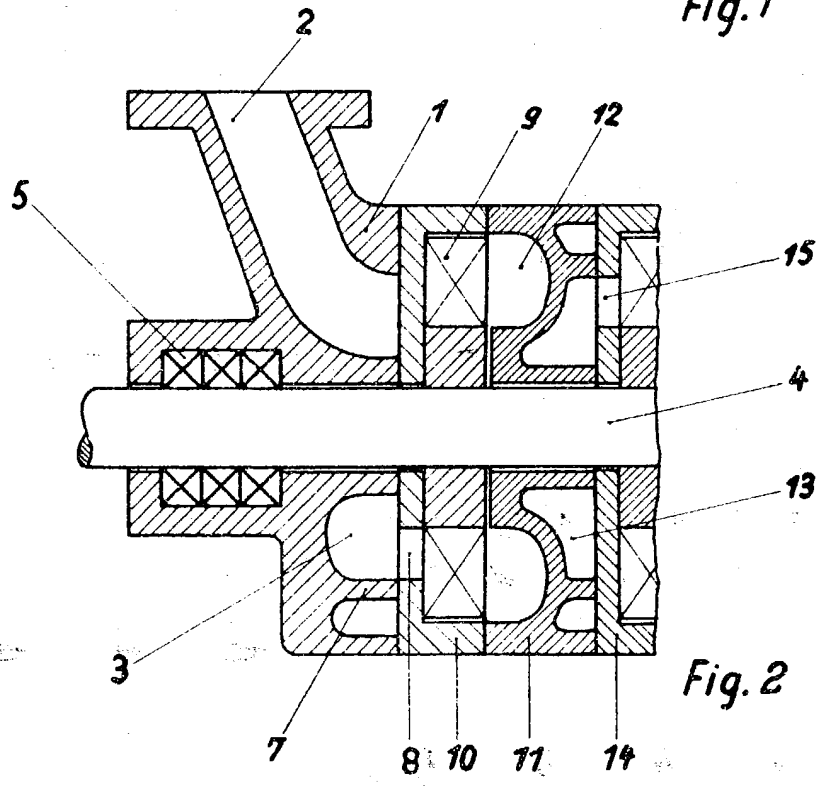

Fig. 2

415/55.1

PATENT SPECIFICATION

DRAWINGS ATTACHED

886,142

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COMPLETE SPECIFICATION

Improvements in or relating to Centrifugal Pumps

We, SIEMEN & HINSCH MBH, a Company organized under the laws of the Federal Republic of Germany, of Itzehoe/Holstein, Germany, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement: —

The invention relates to self suctioning centrifugal pumps.

The means hitherto adopted of improving $\triangle h$ values in the case of lateral channel pumps relate exclusively to the design of the lateral channel, and thus of the conveying space or chamber, that is to say, the formation of the inlet and outlet zones of the lateral channel, as also to the design of the pressure release sector, if and when this is incorporated. As the greatest flow losses occur at these points, efforts were first devoted towards finding an improvement in design along hydraulic and constructional lines at these points.

Up to the present, however, little attention has been devoted to the design of the channels for the flow of the liquid in the interior of the pump, outside the actual conveying chambers: it has now been strikingly revealed that it is possible to increase both efficiency and the $\triangle h$ values by shaping these channels in conformity with good streamlining technique.

The liquid passes from the pump intake into the suction chamber of the pump, the suction chamber, in the known types of pumps, being bounded, on the outer side, by the inside diameter of the pump housing, and, on the inner side, by the boss of the control disc, i.e. of the suction cover.

At this point, in addition to the liquid being compelled to flow against more or less sharp edges, an immediate and violent increase in the transverse section occurs, with resultant alteration in the speed of flow and with the creation of turbulence of the inflowing medium, thus resulting in a corresponding loss in efficiency.

In another known design, an alteration has been made in that the liquid is conducted direct from the pump intake to the suction slot or opening in the first stage of the pump, tangentially. The disadvantage of this design lies in the fact that, due to the design, the position of the suction opening in the first stage is absolutely fixed. Where the number of these stages vary, however, the position of the suction opening in the first stage may also vary, since, on the one hand the position of the pressure slot of the last stage is determined by an optimum power of self-suction on the part of the pump, and, on the other hand, the suction slots of the individual stages must be set at fixed angles one to the other, in order to equalise radial shaft loads, and, by this means, to avoid any considerable deflection of the shaft.

In the case of the ordinary types of pumps the spaces between the various stages are not of any particular shape, the shape and size of these resulting merely from the design of the bounding control disc and intermediate parts.

The invention, therefore, proposes to form a suction chamber adjacent to the pump intake and/or the transfer chambers between the individual stages of the pump at least in part as an annular channel around the shaft, of approximately the same section as the intake.

Thus according to the present invention a single-stage or multi-stage centrifugal pump with only partial admission to the impellor is characterised in that the suction space or chamber adjacent the pump intake and/or the transfer or conveying chambers between any individual stages of the pump is or are each shaped at least in part in the form of an annular channel around the pump shaft, said channel having a section approximately the same as that of the pump intake. The material pumped can then be taken with virtually no alteration in speed from the suction inlet direct into the annular channel, and can flow with a

minimum of loss to the suction opening of the first stage or from the pressure slot of the one stage to the suction slot of the following stage.

The annular channel in front of the first stage must extend over at least such a circumferential angle as to allow of the liquid flowing into it at any possible position of the suction slot of the first stage. It has proved to be particularly beneficial to arrange the annular channels concentric to the pump shaft.

To make certain of obtaining a specific direction of flow in the annular channel connected to the pump intake a thin guide can be effectively disposed so that the material pumped is led into the annular channel in the direction of rotation desired.

Since in the region of the suction slots the side channels frequently approach the impellor boss and the outer, radial limit of the suction slot lies closer to the shaft than the outer radial limit of the side channel, it is also of advantage to [redacted] is of the shaft rather less than the distance between the side channel and the axis of the shaft. This arrangement, moreover, permits of the pump being kept shorter in length.

The invention will now be described further, by way of example only, with reference to the accompanying drawings illustrating one embodiment thereof and in which:—

Fig. 1 is a plan of a suction piece; and

Fig. 2 shows, diagrammatically, a section through the suction side of the pump.

Referring now to the drawings the medium to be pumped flows into the pump through an intake 2 into a suction space or suction chamber 3 in the suction cover, the suction chamber being in the form of an annular channel. The pump shaft 4 is sealed on the suction side by means of a gland 5. A flow conductor rib 6 is provided and the effect of the rib 6 is that the medium pumped, coming from intake 2 flows through the annular space in one definite direction only. As can be seen from the drawing, it is quite immaterial where, on the periphery, the suction slot 8 of the first stage lies. In any event the medium pumped flows to the suction slot of the first stage without any appreciable loss stemming from violent and sudden variations in speed or direction. It is also apparent from the drawing that the distance between the annular channel 3 and the axis of the shaft is, with advantage, less than the distance between the side channel 12 and the axis of the shaft, the side channel being limited on the outer side by the inner diameter of the pump housing 10 and 11, the annular channel being bounded on the outside by the web 7. The medium pumped flows through suction slot 8 into the segments of the impellor 9 and into the side channel 12, and reaches the annular chamber 13 in the intermediate section 11, through the pressure slot (not shown) of the first stage: thence it flows through the suction slot 15 in the intermediate portion 14 of the second stage.

The annular channel 13 between the successive stages can be made of a similar shape to that of the suction chamber of the pump.

A pump according to the present invention possess increased efficiency and improved $\triangle h$ values and compares favourably with centrifugal pumps to which a medium is applied over the full periphery.

WHAT WE CLAIM IS:—

1. A single-stage or multi-stage centrifugal pump with partial admission to the [redacted]ellor, characterised in that the suction space or chamber adjacent the pump intake and/or the transfer or conveying chambers between any individual stages of the pump is or are each shaped at least in part in the form of an annular channel around the pump shaft, said channel having a section approximately the same as that of the pump intake.

2. A centrifugal pump as claimed in Claim 1, further characterised in that each annular channel is concentric with the shaft.

3. A centrifugal pump as claimed in Claim 1 or 2, further characterised in that a guide rib joining the pump intake to the suction chamber is of such form as to force the pumped medium in a definite direction of rotation in the annular channel.

4. A centrifugal pump as claimed in any one of Claims 1 to 3, further characterised in that the distance between the annular channel and the centre of the shaft is less than the distance between the side channel and the centre of the shaft.

5. A single-stage or multi-stage centrifugal pump substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

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